

What is claimed is:

- 1 A wheel comprising:
 - a disc portion; and
 - a rim portion substantially contiguous with said disc portionwherein said wheel is of substantially unitary steel construction.
- 2 The wheel of Claim 1, further comprising a flange portion which is substantially contiguous with said rim portion.
- 3 The wheel of Claim 1, further comprising a well portion, which is substantially contiguous with, said rim portion.
- 4 The wheel of Claim 1, further comprising a bead-seat portion, which is substantially contiguous with, said rim portion.
- 5 The wheel of Claim 4, wherein said bead-seat has about a 5° or 15° taper.
- 6 The wheel of Claim 5, wherein said wheel has a 5° or 15° drop center rim.
- 7 The wheel of Claim 1, further comprising an inner flange portion and an outer rim portion, wherein said inner and outer flange portions are substantially contiguous with said rim portion.

- 8 The wheel of Claim 1, further comprising an inner flange portion and an outer flange portion, wherein said inner and outer flange portions are substantially contiguous with said rim portion and are positioned approximately at opposing ends of said rim portion; a well portion substantially contiguous with said rim portion; an inner bead seat portion substantially contiguous with said rim portion; and an outer bead seat portion substantially contiguous with said rim portion, wherein said inner bead seat portion is approximately positioned between said inner flange portion and said well portion, and wherein said outer bead seat portion is approximately positioned between said outer flange portion and said well portion.
- 9 The steel wheel of Claim 1, wherein said disc portion has a center opening therethrough.
- 10 The wheel of Claim 1, wherein said disc portion has at least one mounting opening the therethrough.
- 11 The wheel of Claim 1, wherein said disc portion has at least one vent opening therethrough.
- 12 The wheel of Claim 1, wherein said disc portion has at least one valve opening therethrough.
- 13 The wheel of Claim 1, substantially mounted to a vehicle.
- 14 The wheel of Claim 1, further comprising a tire substantially mounted to said wheel.

15 A method of manufacturing a wheel comprising the steps of:

forming a disc portion; and

forming a rim portion wherein said rim portion is substantially contiguous with said disc portion and wherein said wheel is of substantially unitary steel construction.

16 The method of Claim 15, wherein said wheel is formed from steel stock of substantially uniform thickness.

17 The method of Claim 15, further comprising the step of forming a flange portion, wherein said flange portion is substantially contiguous with said rim portion.

18 The method of Claim 15, further comprising the step of forming a well portion, wherein said well portion is substantially contiguous with said rim portion.

19 The method of Claim 15, further comprising the step of forming an inner flange portion and an outer flange portion, wherein said flange portions are substantially contiguous with said rim portion.

20 The method of Claim 15, further comprising the step of forming a bead-seat portion, wherein said bead-seat portion is substantially contiguous with said rim portion.

21 The method of Claim 20, wherein said bead-seat is formed with about a 5° or 15° taper.

- 22 The method of Claim 21, wherein said wheel is formed with a drop center rim.
- 23 The method of Claim 15, further comprising the step of forming a center opening in said disc portion.
- 24 The method of Claim 15, further comprising the step of forming at least one mounting opening in said disc portion.
- 25 The method of Claim 15, further comprising the step of forming at least one vent opening in said disc portion.
- 26 The method of Claim 15, further comprising the step of forming at least one valve opening in said disc portion.
- 27 The method of Claim 15, wherein said forming steps comprise at least one of spinning and/or flow forming processes.
- 28 The method of Claim 15, wherein said method utilizes a spinning machine.
- 29 A wheel of unitary steel construction produced in accordance with the method of Claim 15.
- 30 A method of manufacturing a one-piece wheel of 5° and 15° drop center rim of the type having well, inner & outer bead-seat and flanges wherein the said method comprises the following steps:
- a. Providing a generally circular steel blank;
 - b. The blank is preferably of pre-determined uniform thickness;

- c. The blank is preferably with a center hole pierced to a predetermined size;
- d. The blank is preformed to a predetermined cylindrical shape & size by spinning & flow forming in a CNC spinning machine, the blank being positioned & clamped between a inner mandrel and a clamping plate, such inner mandrel having a outboard surface which conforms to an predetermined inner diameter wherein the well, inner & outer bead seats and the outer flange are formed in the subsequent operations;
- e. The spun and flow formed preform to an predetermined cylindrical shape & size is further spun in a CNC spinning machine to reduce thickness consequently to increase the width in the forward direction to an predetermined size while maintaining the predetermined inner diameter wherein the well, inner & outer bead seats and the outer flange are formed in the subsequent operations and at the same time further spinning is preformed on the peripheral portion of the cylinder to displace the material in the backward direction to a predetermined shape & size of the inner flange; and
- f. The perform from the previous step, is further spun in a CNC spinning machine to impart final shape and profile to the rim portion comprising of well, inner & outer bead seats and inner & outer flanges using such inner mandrel, the central line axis of which is slightly offset against the centerline of the central hole of the perform during spinning operation.

31 The method as claimed in claim 30 wherein spin forming the peripheral of the blank by engaging the same with a forming roller so as to

obtain controlled thickness reduction and shape in the peripheral and inner portion of the blank.

32 The method as claimed in claim 30 wherein the material is displaced in the backward direction during spinning a portion of the perform peripheral cylindrical portion against the outboard surface of an outwardly positioned outer roll to form a predetermined cylindrical portion of the inner flange.

33 The method as claimed in claim 30 wherein spin forming a portion of the blank peripheral portion by engaging the same with a forming roller to form the final shape of the well.

34 The method as claimed in claim 30 wherein spin forming a portion of the blank peripheral portion by engaging the same with a forming roller to form the final shape of the bead seat.

35 The method as claimed in claim 30 wherein spin forming the bead seat portion of the perform blank by engaging the same with a forming roller against the outboard surface of the outer mandrel to form the final shape of outer flange.

36 The method as claimed in claim 30, wherein: said first-named spin forming step consists a plurality of passes of the forming roller.

37 The method as claimed in claim 30 wherein after finish spinning operation boltholes are pierced in a conventional press.

38 The method as claimed in claim 30 wherein after piercing the center hole, bolt holes, vent holes are pierced in a conventional press.

39 The method as claimed in claim 30 wherein after piercing the center, bolt holes & vent holes, the center hole and the mounting holes are accurately machined to required size.

- 40 The method as claimed in claim 30 wherein after machining the center hole and the mounting holes to an accurate required size, the inner & outer flange crown edges are machined to provide a radius or a flat.
- 41 The method as claimed in claim 30 wherein said step (a) consists the step of providing a disc blank of substantially uniform thickness of low carbon steel or HSLA steel composition.
- 42 The method as claimed in claim 30 wherein a butt-welded hoop of predetermined diameter, width and thickness can also be used instead of a blank.
- 43 The method as claimed in 39 wherein the butt-welded hoop of predetermined diameter, width and thickness can also be used to manufacture the rim part alone.
- 44 The method as claimed in 39 wherein the butt-welded hoop of predetermined diameter, width and thickness can also be used to manufacture of the rim part alone.
- 45 Apparatus for manufacturing a one-piece wheel of 5⁰ and 15⁰ drop center rim of the type having an integral disc and rim portion well, inner & outer & inner bead-seat and fixed flanges wherein the said method comprises means for providing a generally circular blank means for forming the blank to of pre-determined uniform thickness the blank is preferably with a center hole pierced to a predetermined size, the blank is pre-formed in a spinning machine, the pre-form blank further spun in a spinning machine, being positioned between an mandrel and clamping plate, such mandrel having a outboard surface which conforms to the shape of the well, inner & outer bead seat & fixed flanges, the blank peripheral & inner portions is spun and flow formed against the outboard surface of

the inner mandrel and shaping rolls to form the final shapes of the rim comprising of well, bead seat and flanges

46 Apparatus for manufacturing a one-piece wheel of 5° and 15° drop center rim for a vehicle having an integral disc and rim portion comprising of well, bead seats and flanges manufactured by the process claimed in claim 30.

47 A one-piece wheel of 5° and 15° drop center rim for a vehicle having an integral disc and rim portion as claimed in claim 30 comprising of well, bead seat and flanges wherein when spin forming machine is programmed to form different shapes.

48 A method of manufacturing a one-piece wheel of 5° and 15° drop center rim for a vehicle having an integral disc and rim portion as claimed in claim 30 comprising of well, bead seat and flanges as described in the description of complete specification and as illustrated by way of drawings accompanying the complete specification.

49 A one-piece wheel of 5° and 15° drop center rim for a vehicle having an integral disc and rim portion as claimed in claim 1 comprising of well, inner and outer bead seats and inner and outer flanges as described in the description of complete specification and as illustrated by way of drawings accompanying the complete specification.

50 A one-piece wheel of 5° and 15° drop center rim for a family of vehicle wheels having any plurality of axial width, diameter and offset having an integral disc and rim portion as claimed in claim 30 comprising of well, inner and outer bead seats and inner and outer

flanges as described in the description of complete specification and as illustrated by way of drawings accompanying the complete specification, may be produced from the blanks.

51 An apparatus for manufacturing from a steel blank a steel wheel of substantially unitary construction comprising a disc portion and a rim portion, said apparatus comprising:

- a. a frame;
- b. a rotating component which is substantially rotatably affixed to said frame and which rotates said blank;
- c. a clamping component which maintains said steel blank in a substantially fixed position relative to said rotating component; and
- d. a forming component, wherein said forming component substantially forms said disc and rim portions into said steel wheel of unitary construction from said steel blank.

52 The apparatus of Claim 51, wherein, said forming component forms a well into said rim portion of said unitary wheel.

53 The apparatus of Claim 51, wherein, said forming component forms one or more bead seats into said rim portion of said unitary wheel.

54 The apparatus of Claim 51, wherein, said forming component forms an inner bead seat and an outer bead seat into said rim portion of said unitary wheel.

55 The apparatus of Claim 51, wherein, said forming component forms an inner bead seat and an outer bead seat into said rim portion of said unitary wheel, and wherein said inner and outer bead seats have approximately a 5° or 15° angle.

56 The apparatus of Claim 51, wherein, said forming component forms one or more flanges into said rim portion of said unitary wheel.

57 The apparatus of Claim 51, wherein, said forming component forms inner and outer flanges into said rim portion of said unitary wheel.

58 The apparatus of Claim 51, wherein, said forming component forms a unitary wheel having approximately a 5° or 15° drop center rim.